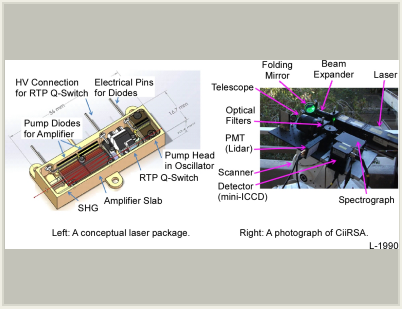
Small Business Innovation Research/Small Business Tech Transfer

Compact Laser for In-Situ Compositional Analysis, Phase I

Completed Technology Project (2015 - 2016)

Project Introduction

In response to NASA's solicitation for light-weight and power efficient instruments that enable in situ compositional analysis, Q-Peak in partnership with the University of Hawaii proposes to develop a compact, robust, and efficient instrument to combine all laser based spectroscopies capable of performing imaging, Raman, Laser Induced Breakdown, Laser Induced Fluorescence and LIDAR The main advantage in using this suite of instruments is the collection of information from imaging to elemental composition of rock samples by simply directing a laser beam on remote targets of interest. Based on the success of the current Mars Science Laboratory rover instrument ChemCam, the first ever laser-based spectrographic system to be selected as an instrument on a NASA spacecraft, the Hawaii Institute of Geophysics and Planetology (HIGP) has developed and tested a prototype instrument. This new instrument is capable of at least 10,000 times greater sensitivity than the ChemCam instrument, allowing faster measurements up to 8 m away with a focused laser beam. This integrated, compact remote instrument is called the Compact integrated instrument for Remote Spectroscopy Analysis (CiiRSA). Replacing the existing laser with the Q-Peak proposed laser will reduce CiiRSA's weight by 30 % and volume by 20 %. In Phase I, Q-Peak will design, develop and build a laser that will produce 1-2 mJ of energy in < 2 ns pulse duration at 1047 nm and our partner HIGP will characterize the CiiRSA instrument at the anticipated energy and wavelength of the full system (5 mJ at 523 nm) to understand the ranging and performance of the final system. In Phase II, Q-Peak is proposing an ultra-compact laser with 10 cm3 in volume that will produce > 5 mJ, < 2 ns duration pulses at 523 nm at repetition rates from single-shot to 100 Hz. The entire laser system will be integrated into a suite of instruments that our partner at HIGP has developed to reduce the overall SWaP of the CiiRSA system.



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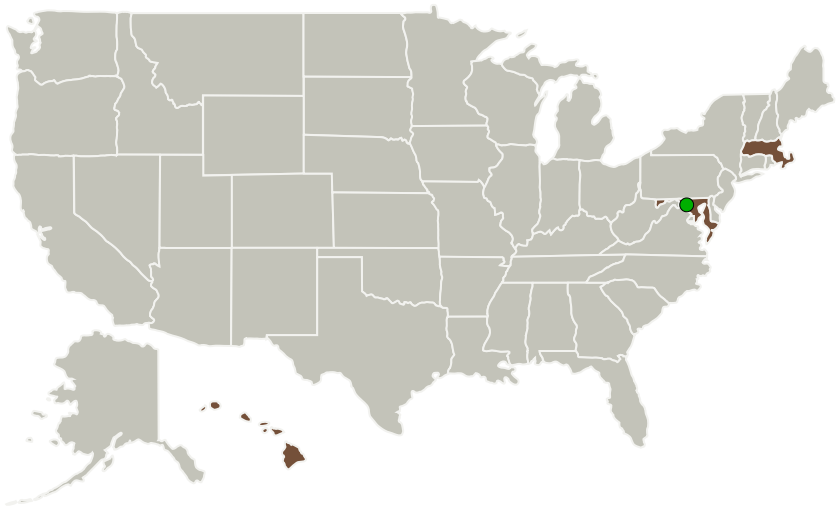
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Q-Peak, Inc.	Lead Organization	Industry	Bedford, Massachusetts
Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland
University of Hawaii Maui College	Supporting Organization	Academia	Kahului, Hawaii

Primary U.S. Work Locations	
Hawaii	Maryland
Massachusetts	

Project Transitions

June 2015: Project Start

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Q-Peak, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Bhabana Pati

Co-Investigator:

Bhabana Pati

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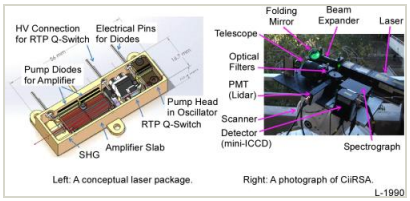
June 2016: Closed out

Closeout Summary: Compact laser for in-situ compositional analysis, Phase I P roject Image

Closeout Documentation:

- Final Summary Chart Image*(https://techport.nasa.gov/file/138756)*

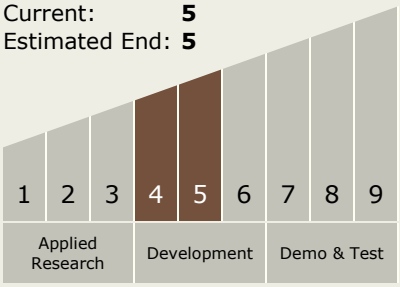
Images



Briefing Chart Image
Compact laser for in-situ compositional analysis, Phase I *(https://techport.nasa.gov/image/136406)*

Technology Maturity (TRL)

Start: **4**
Current: **5**
Estimated End: **5**



Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.5 Lasers

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System